1 Introduction

1.0 Summary

This chapter is an introduction to the 2001 Energy Efficiency Standards for Nonresidential Buildings, High-Rise Residential Buildings and Hotels/Motels (*Standards*), as well as this Nonresidential Manual (*Manual*). Section 1.1 summarizes the reasons for having energy standards and explains the organization of this *Manual*. This is followed by Sections 1.2 and 1.3 that outline the changes brought about by the 2001 *Standards* and the history of the Standards since their inception in 1978. Section 1.4 introduces the basic approaches to complying with the *Standards*, and briefly discusses some of the compliance options available.

Throughout the *Manual*, sections within this *Manual* are referred to as 'Section', and sections in the *Standard* are represented by "§" (unless the reference occurs within an excerpt from the *Standards*). Definitions in italics are quoted from §101(b) throughout this *Manual*.

1.1 Purpose and Organization of this Manual

This *Nonresidential Manual* is organized into six chapters and several appendices. Each chapter of the *Manual* covers a major set of related topics regarding compliance with the requirements of the *Standards*.

***Chapter** 1,* this *Introduction,* serves as a brief overview of the *Standards* and this *Manual.* ***Chapter** 2,* discusses the *Scope and Application* of the *Standards*, explaining when they apply to a particular building and discussing some application problems that may arise. Chapter *2* will help in deciding if the *Standards* apply to the project.

***Chapters** 3,* 4 a*nd* 5 discuss the *Standards* in terms of the three major components: envelope, mechanical and lighting. These chapters are written to be largely stand-alone for the discipline to which it applies. For example, the HVAC system designer will find all the mechanical system requirements fully discussed in Chapter 4. Likewise, the building department's mechanical plan checker and inspector can concentrate on Chapter *5*.

***Chapter** 6,* discusses several *Special Topics* that can apply to any of the components. This includes a discussion of the Performance Approach, High-rise Residential Buildings, and Hotels and Motels.

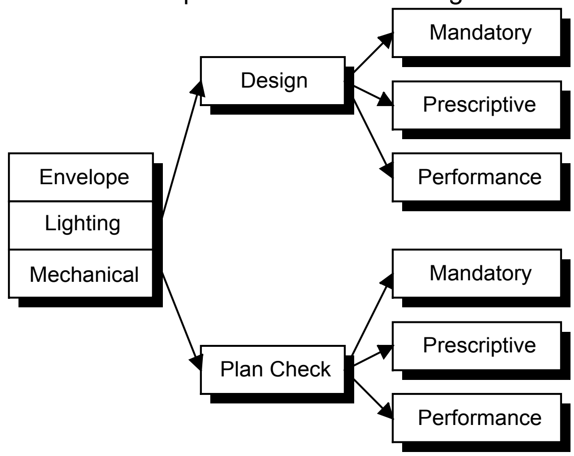
These three chapters are organized into subsections that address the major phases of a building project:

- The *Design* section discusses the requirements as they affect the design process; the principles of each requirement are explained and illustrated.
- The *Plan Check Documents* section is addressed to those who prepare the construction documents and compliance calculations for review by the building department's plan checker. It is also addressed to the plan checker. This section focuses on the specific information that must be included in the plans and on the compliance forms to adequately demonstrate compliance.

Each of the sections addresses the Mandatory Measures, the Prescriptive Approach and the Performance Approach.

The organization of these three chapters is illustrated in Figure 1-1.

Figure 1-1: Organization of Chapters 3, 4 and 5



In addition to the major parts of these three chapters, there are two sections at the beginning of each chapter.

Summary provides a brief overview of the chapter contents.

Introduction provides basic information about the component and its compliance requirements:

Compliance Approaches explains the options available for compliance for the given building component.

Basic Concepts explains the definitions and technical concepts necessary to an understanding of the *Standards* requirements applicable to the component.

Appendices contain reference tables, charts, and definitions that support the implementation of the *Standards,* including data on construction assemblies, and Climate Zone Descriptions.

Tables of Contents and Index - at the front and back of the Manual - provide cross-references to the material in the document.

Note: Two notation conventions are used throughout this Manual in making cross-references:

1. References to other locations within this Manual are called out by Section number: “see Section 3.2.2D”

2. References to the 2001 Energy Efficiency Standards are called out by section “§” number: “§143(b)”

1.2 Summary of Recent Changes

This section describes recent events in California and how the standards have changed in response to these events.

1.2.1 California's Energy Crisis and Assembly Bill 970

In the summer of 2000, California experienced rolling blackouts in the San Francisco Bay area, and electricity bills in San Diego that went up by as much as 300%. These events signaled the beginning of an energy crisis that continued into 2001 with rolling blackouts becoming a common occurrence throughout the state. High-energy prices have depleted the state surplus and caused California's largest utility to file Chapter 11 bankruptcy. At the date of this writing, the State's electrical system continues to be vulnerable to increasing electricity demand, generation supply shortages, transmission constraints, and extremely high wholesale electricity costs caused by an unstable market.

A. Assembly Bill 970

At the close of the 2000 legislative session, the Legislature responded to the crisis by passing AB 970, an urgency statute that became effective when the Governor signed it on September 6, 2000. The statute, known as the California Energy and Reliability Act of 2000, found that there has been significant growth in the demand for electricity and that new power plant construction and energy conservation have seriously lagged. The act provides a balanced response by providing significant investment in conservation and demand-side management programs. In particular, AB 970 added Section 25553 to the Warren Alquist Act, as follows:

> Notwithstanding any other provision of law, on or before 120 days after the effective date of this section or on the earliest feasible date thereafter, the Commission shall . . . (b) Adopt and implement updated and cost-effective standards pursuant to Section 25402 to ensure the maximum feasible reductions in wasteful, uneconomic, inefficient, or unnecessary consumption of electricity.

In response to AB 970, the *Energy Commission* conducted an emergency rulemaking to develop amendments to the Standards, which were adopted by the *Energy Commission* on January 3, 2001(119 days after AB 970 was signed by the Governor). The AB 970 amendments to the Standards focused on reducing peak electricity consumption and demand in the shortest time possible. For consideration in the AB 970 rulemaking, measures had to have the following characteristics:

- Substantial information was already available regarding their benefits and costs;
- Specifications and eligibility criteria could be developed quickly within the time the Legislature allotted; and
- The industry would be able to incorporate the changes on an emergency basis without disruption to construction practice.

B. The Worsening Situation

Since AB 970 was passed by the Legislature and the 2001 Standards were adopted, the reliability of California s electricity system has continued to deteriorate. In his January 2001 State of the State message, the Governor placed highest priority on actions to address what he termed the electricity nightmare. He included the following points in his message: Electricity is a basic necessity of life. It is the very fuel, which powers our high-tech economy. A dysfunctional energy market is threatening to disrupt people's lives and damage our economy. It has resulted in skyrocketing prices and an unreliable supply of electricity, causing the average price per megawatt hour to increase by 900%, compared to last year. By reducing peak demand, we can reduce the price: avoid shortages, and lower energy bills.

In January 2001, power plant outages lead to inadequate electricity supplies in California, causing multiple Stage 3 alerts and rolling blackouts in Northern California. The cost of natural gas also has rapidly increased during this period.

The *Energy Commission* is continuing to update the standards to respond to the energy crisis. Additional enhancements and improvements are being planned for the next update, to be adopted in about July 2004 and take effect in 2005.

1.2.2 Assembly Bill 970 Changes

This section summarizes the 2001 changes to the nonresidential standards that were adopted as part of the AB 970 emergency rulemaking. The most significant changes were updates to the fenestration criteria and additional requirements for NFRC testing of site-built fenestration. In addition, credits for cool roofs were added; exterior lighting requirements were added; several other provisions of the lighting standards were adjusted; HVAC equipment efficiencies were made more stringent; and miscellaneous other additions were made to the HVAC requirements. These are summarized below:

A. Fenestration

The U-factor and SHGC criteria for fenestration were updated. These criteria were last updated in 1992, and at that time, the *Energy Commission* only considered clear and tinted glazing constructions in developing the criteria because of aesthetic issues related to reflective glass as well as cost and availability uncertainties related to low-e coatings. Fenestration technologies have improved in the last 10 years; the markets are more stable. The new *Standards* consider a wide variety of modern glazing constructions, and as result, are more stringent and appropriate. The structure of the standard was also modified so that the SHGC criteria become more stringent with larger window-wall ratios.

Require NFRC testing and labeling for site-built fenestration in nonresidential buildings with more than 100,000 ft² of conditioned floor area and 10,000 ft² of vertical fenestration area. Previously, NFRC had no test procedure for curtain walls and other site-built fenestration products. To meet this requirement, curtain wall suppliers or glazing contractors must have products rated and certified in accordance with the NFRC Site-Built Program.

B. Cool Roofs

A credit for cool roofs is added that can be used with both the prescriptive overall envelope approach and the whole building performance method. Cool roofs have both a high reflectance and a high emittance. The high reflectance keeps much of the sun's energy from being absorbed and becoming a component of heat transfer. The high emittance assures that when the roof does warm up, its heat can escape through radiation to the sky. Cool roofs were not previously considered in the standards.

C. Lighting

A number of miscellaneous changes were made to the lighting requirements as described below:

- *Lamps used in exterior lighting applications that are larger than 100 W must have a minimum efficacy of 60 lumens/watt or be controlled by a motion sensor.* The requirement will have little impact on compact fluorescents since they are less than 100 W.
- *Several of the complete building and area category lighting power density allowances are modified to be consistent with ASHRAE/IESNA Standard 90.1-1999.* In particular a separate allowance is added for convention centers and the allowance for hotel lobbies and locker rooms is reduced slightly.
- *The exceptions for bi-level illumination are modified, requiring the control even when an occupant sensor is installed.* This will cause the requirement to apply to more cases and increase the ability of building owners to respond to power emergencies.
- *A loophole for task lighting in office applications is closed.* The lighting power allowance for offices was always intended to include task lighting, but task lighting has previously been ignored.
- *The power credit for lumen maintenance was eliminated since this technology is no longer used.*

D. HVAC

A number of changes were made to the HVAC requirements, as summarized below. The most significant of these was to update the minimum equipment efficiencies.

- *The HVAC equipment efficiency requirements were updated to be consistent with ASHRAE/IESNA Standard 90.1-1999.* ASHRAE 1999 had more stringent equipment efficiency requirements than California 1998 for non-NAECA HVAC equipment. The ASHRAE efficiency requirements were justified through life cycle cost analysis, using cost data provided by the manufacturers through their trade organizations, the Air-conditioning and Refrigeration Institute (ARI) and the Gas Appliance Manufacturers Association (GAMA).
- *Additional mandatory measures were added to mitigate standby losses for gas- and oil-fired forced air furnaces.* The requirements include power venting, vent dampers or flue dampers when the equipment is in conditioned space; intermittent ignition or interrupted devices (IID) regardless of location; and limits on jacket losses for furnaces located in unconditioned spaces.
- *A tradeoff method is added for centrifugal chillers designed to operate at non-ARI standard test conditions.*
- *A prescriptive trade-off table is added for airside economizers that allow higher equipment efficiencies in lieu of an economizer for unitary air-conditioners and heat pumps.* This requirement is a modification of a trade-off developed for ASHRAE Standard 90.1-1999, but adapted for the 16 California climate zones.
- *Requirements are added for the type of high-limit switch, which can be used for air-side economizers.* This requirement is based on ASHRAE 1999, but adapted for California climates.
- *Language is added to the standard to protect pipe and duct insulation that is exposed to outdoor conditions and unconditioned space*.
- *High occupancy spaces, requiring a large quantity of outdoor air, must have demand ventilation controls such as CO_2 sensors to minimize quantities of outdoor air when not needed.*
- *Fan speed controls are required for cooling towers and air-cooled or evaporative cooled condensers.*

E. Air Distribution Ducts

The Nonresidential Alternative Calculation Method (ACM) is modified to include the impact of duct leakage and insulation levels on heating equipment efficiency and cooling equipment efficiency for individual packaged equipment serving 5000 ft² or less. The procedure applies only to duct work located in spaces above insulated ceilings and beneath the roof.

1.3 Background

1.3.1 Legal Requirements – The Warren Alquist Act

All new buildings in California must meet the *Standards* and the administrative requirements of the *California Code of Regulations,* Title 24, Parts 1 and 6. Some requirements in the *Appliance Efficiency Regulations* of Title 20, Sections 1601 - 1608, also apply.

The statutory basis for the *Standards* is Section 25402 of the *Public Resources Code,* which states:

The California Energy Commission shall:" Prescribe, by regulation, building design and construction standards that increase the efficiency in the use of energy for new residential and new nonresidential buildings. The standards shall be cost effective, when taken in their entirety, and when amortized over the economic life of the structure when compared with historical practice...."

The purpose of this *Manual* is to explain clearly how to comply with and enforce the current *Standards* for nonresidential buildings. The *Manual* is written as both a reference source and an instructional guide, and can be used by architects, builders, building owners, designers, energy consultants, enforcement agency personnel, engineers, mechanical contractors and others directly or indirectly involved in the compliance process. The *Manual* is divided into six chapters, each describing how the *Standards* apply to specific building components or situations.

Changes to the standards occur periodically to account for improvements in conservation technologies, changes in the cost of fuels and energy-conserving strategies, and improved capabilities in analyzing building energy performance. In addition, modifications are also made to further improve compliance and enforcement.

1.3.2 Benefits of the Standards

There are numerous reasons to use energy more efficiently in buildings. First of all there is a benefit in terms of improving the reliability of our electric systems. Another benefit is improved comfort. Efficiency also makes sense from an economic perspective. Investing in building energy conservation helps ensure that buildings are affordable to operate both now and into the future. The *Standards* also produce environmental benefits, reducing risk of oil spills, acid rain, smog and other forms of pollution. In addition, the energy created by burning fossil fuels may lead to global climate change as a result of the Greenhouse Effect." These and other benefits are discussed in greater detail below.

The National Academy of Sciences has urged the entire country to follow California's lead to "make conservation and efficiency the chief element in energy policy." The first efficiency recommendation was simple: "adopt nationwide energy efficient building codes."

A. Energy Reliability and Demand

Buildings are one of the major contributors to electricity demand. With the 2000/2001 California energy crisis, the importance of conservation and efficiency is brought again to the forefront. The AB 970 changes will result in savings of over 800,000 therms/year of gas and about 100,000 MWh of electricity use. Perhaps more importantly, as much as 150 MW of peak demand of electricity is reduced. Furthermore, these savings are cumulative, which means that they double in two years, triple in three, etc.

B. Comfort

Compelling reasons exist for more efficient energy use in buildings. Comfort is an important reason. If a house is drafty, even a large, modern furnace will not keep it comfortable on a winter day. On a hot summer day no reasonable amount of air conditioning can maintain an appropriate sense of coolness in a room surrounded by clear unshaded glass windows without shading. The mechanical heating and cooling equipment are only part of the overall system that maintains a pleasantly comfortable indoor environment. The building shell (or envelope) is equally important and energy efficiency helps ensure that new homes maintain a reasonable level of comfort.

C. Economics

For the building owner or energy-bill paying building tenant, investing in building energy conservation helps to ensure that energy costs are affordable both now and in the future. Banks and other financial institutions recognize the impact of efficiency through energy efficient mortgages.

From a broader perspective, the less California depends on depletable resources such as natural gas, coal, and oil, the stronger and more stable its economy will remain in the face of increases in costs of these resources. A cost-effective investment in energy efficiency benefits the entire state.

D. Environment

Energy efficiency also benefits the local environment. In many parts of the world, the use of traditional sources of energy has led to oil spills, acid rain, smog, and other forms of environmental pollution that have ruined its environment and natural beauty. California is not immune to these problems, but the risks would be greater without appliance standards, building standards, and utility programs that promote efficiency and conservation. Another significant benefit is - reduced destruction of natural habitats, which in turn helps protect animals, plants, and the natural systems.

E. Global Warming

Finally, the state faces a major uncertainty—global climate change or global warming. One of the contributors to global warming is a by-product of burning fossil fuel. When fossil fuel is burned- no matter how cleanly- carbon dioxide is added to an atmosphere. The added gas forms an insulating layer on the earth leading to global climate change.

Most scientists agree that the effects of global warming will be significant. According to California Energy Commission (hereafter *Energy Commission*) research, most of the sectors of the state economy face significant risk from climate change including water resources, agriculture, forests, and the natural habitats of a number of indigenous plants and animals.

Most scientists recommend that actions be taken to reduce emissions of carbon dioxide and other greenhouse gasses. While adding scrubbers to power plants and catalytic converters to cars is a step in the right direction, those actions do not limit the carbon dioxide we emit into the atmosphere. Using energy efficiently is a far-reaching strategy that can make an important contribution to the reduction of greenhouse gasses. The National Academy of Sciences urged the whole country to follow California's lead on such efforts, saying that we should make conservation and efficiency the chief element in energy policy. Their first efficiency recommendation was simple: Adopt nationwide energy efficient building codes. Energy conservation will not only increase comfort levels and save homeowners money; it will also play a vital role in creating and maintaining a healthy environment.

1.3.3 History of the Standards

The Legislature created the State Energy Resources Conservation and Development Commission (*Energy Commission*) in 1974 to deal with energy-related issues, and mandated that the *Energy Commission* adopt conservation standards for new buildings. The first standards were adopted in 1977. This was in the wake of the Organization of Petroleum Exporting Countries (OPEC) oil embargo of 1973.

So-called “First Generation” standards for nonresidential buildings took effect in 1978. Those nonresidential standards remained in effect for all nonresidential occupancies until the late 1980s, when the “Second Generation” standards took effect for offices, retail and wholesale stores.

The next major revision occurred in 1992 when the requirements were simplified and consolidated for all building types. At this time, major changes were made to the lighting requirements, the building envelope and fenestration requirements, as well as the HVAC and mechanical requirements.

Table J-1 in Appendix J summarizes the *History of the Standards and Manuals* in effect since 1978 and lists the name of the compliance manual that was used in conjunction with that set of standards.

1.4 Introduction to the Standards

The *Standards* provide flexibility to the designer by providing several paths to standards compliance. This section introduces the basic choices, or approaches, that are available. The details of how the different approaches apply to the building and its systems are covered in the following chapters.

There are two basic options for demonstrating that a building meets the requirements of the *Standards:* the prescriptive approach and the performance approach. With either approach, certain mandatory measures always apply.

The *Standards* cover the three major components of a nonresidential building: the building envelope, the mechanical systems, and the lighting systems. A minor energy user, water heating, is also covered. Each component is typically the responsibility of a different design professional. The envelope is designed by an architect, the mechanical systems by a mechanical engineer, and the lighting systems by an electrical engineer. Each of the three components may be shown to comply independently under the prescriptive approach. Under the performance approach, *Standards* compliance may be shown for the envelope only, the envelope and mechanical systems, or for all three components together.

The building (all three components) may be shown to comply as a whole under the performance approach only when the permit application includes all three components.

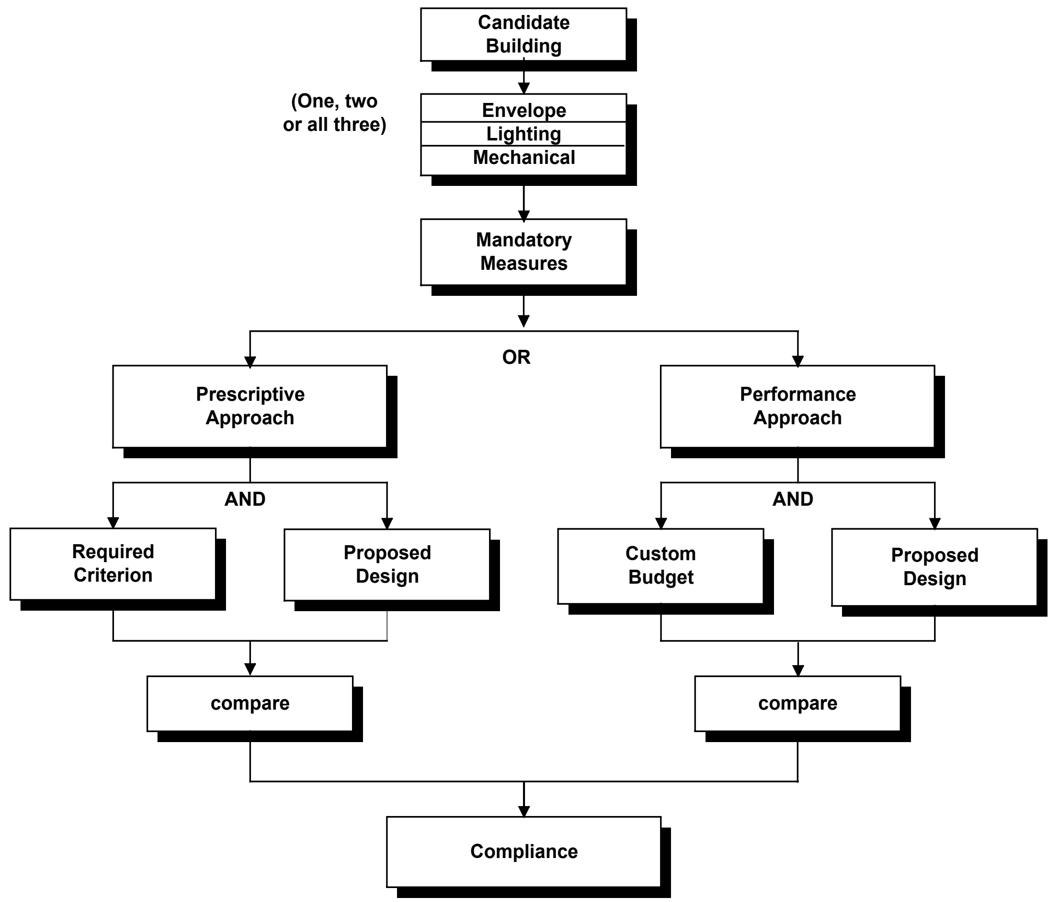
Figure 1-1 graphically illustrates how the three nonresidential building components must each comply with their mandatory measures, and then, either the prescriptive or performance approaches.

The mandatory measures for each of the three components are described in Chapters *3,* 4 *and* 5 of this Manual. In addition Chapter 6 includes mandatory measures for High-Rise Residential and Motel/Hotel.

The prescriptive approach is the simpler way to comply with the *Standards*. Each of the three building components complies separately from the others. The compliance procedures and documentation are also separate for the three.

The prescriptive approach for each component requires that the proposed system design be shown to meet specific energy efficiency criteria specified by the *Standards*. If the design fails to meet even one of the requirements, then the component does not comply with the *Standards*. The performance approach provides the most flexibility to the building designer for choosing alternative energy efficiency features.

Figure 1-2– Nonresidential Standards Flowchart



1.4.1 Organization of the Standards

The organization of the *Standards* is shown graphically in Table .

Table 1-1 Organization of the Standards

Title 24, Part 1, Article 1 - Administrative Requirements

Title 20, Sections 1601 et seq. - Appliance Efficiency Regulations

Title 24, Part 6, - Energy Efficiency Standards

Subchapter 1 - General Provisions – All Occupancies

- 100 – Scope
- 101 - Definitions and Rules of Construction
- 102 - Calculation of Source Energy Consumption

Subchapter 2 - Mandatory – Equipment Manufacture & Installation of Systems and Equipment – All Occupancies

- 110 - Systems and Equipment - General
- 111 & 112 - Appliances and Space Conditioning Equipment
- 113-115 - Water Heaters, Pools & Spas, Natural Gas, Pilot Lights
- 116-118 - Doors, Windows, Joints Insulation and Cool Roofs
- 119 - Lighting Control Devices

Subchapter 3 - Mandatory – Mechanical Systems and Equipment – Nonresidential, High-rise Residential, and Hotel/Motel Occupancies

- 120 - Space Conditioning and Water Heating Systems and Equipment - General
- 121 - Requirements for Ventilation
- 122 - Required Controls for Space Conditioning Systems
- 123-124 - Requirements for Pipe and Duct Insulation

Subchapter 4 - Mandatory – Lighting Systems and Equipment – Nonresidential, High-rise Residential, and Hotel/Motel Occupancies

- 130 - Lighting General
- 131 - Required Lighting Controls
- 132 - Lighting Circuiting

Subchapter 5 - Performance and Prescriptive Approaches – Nonresidential, High-rise Residential, and Hotel/Motel Occupancies

- 140 - Choice of Performance/ Prescriptive
- 141 - Performance Budgets
- 142 - Prescriptive Approach
- 143 - Prescriptive Envelope
- 144-145 - Prescriptive Mechanical
- 146 - Prescriptive Lighitng

Subchapter 6 - Additions, Alterations and Repairs – Nonresidential, High-rise Residential, and Hotel/Motel Occupancies

- 149 - Additions, Alterations and Repairs

Subchapters 7 & 8 - Low Rise Residential Buildings

- 150-152 - Mandatory, Performance & Prescriptive, Additions and Alterations

1.4.2 Which Standards Apply? Nonresidential vs. Residential

The California standards apply to both nonresidential and residential buildings. This manual addresses the requirements for nonresidential buildings, including hotels, motels, and high-rise residential buildings (those over three stories in height). A companion manual addresses the requirements for low-rise residential buildings. Live-Work buildings are a special case (see Mixed Occupancy in Section 2.2).

Table 1-2 Nonresidential vs. Residential Standards

Nonresidential Standards	Low-Rise Residential Standards
These standards cover all nonresidential occupancies (Group A, B, E, F, H, M or S), as well as high-rise residential (Groups R-1 and R-2 with four or more habitable stories), and all hotel and motel occupancies.	These standards cover all low-rise residential occupancies including:
Applicable compliance manual: This *Nonresidential Manual for Compliance with the Energy Efficiency Standards*, *August 2001*.	Applicable compliance manual: The *Residential Manual for Compliance with the Energy Efficiency Standards*, *August 2001*.
Offices Retail and wholesale stores Grocery stores Restaurants Assembly and conference areas Industrial work buildings Commercial or industrial storage Schools and churches Theaters Hotels and motels Apartment and multi-family buildings, and long-term care facilities (group R-2), with four or more habitable stories	All single family dwellings of any number of stories (Group R-3) All duplex (two-dwelling) buildings of any number of stories (Group R-3) All multi-family buildings with three or fewer habitable stories (Groups R-1 and R-2) Additions and alterations to all of the above buildings
Note: The *Standards* define a habitable story as one that contains space in which humans may live or work in reasonable comfort, and that has at least 50 percent of its volume above grade. Copies of the compliance manuals and other relevant publications may be obtained from the *Energy Commission* - call the Energy Efficiency Hotline for the latest update at 916-654-5106 or 1-800-772-3300 (in California only).	

The current *Standards* (2001 Edition) generally apply to all *Uniform Building Code (UBC)* occupancies of Group A, B, E, F, H, M, R and S buildings that are *mechanically heated or mechanically cooled* resulting in *directly* or *indirectly conditioned space*. Nonresidential buildings that have space conditioning, but do not meet the criteria of a directly or indirectly conditioned building, must comply with the lighting requirements only. Group I or U occupancies are exempt from the *Standards.* The exempt occupancies include buildings such as hospitals, prisons and residential garages.

1.4.3 California Climate Zones

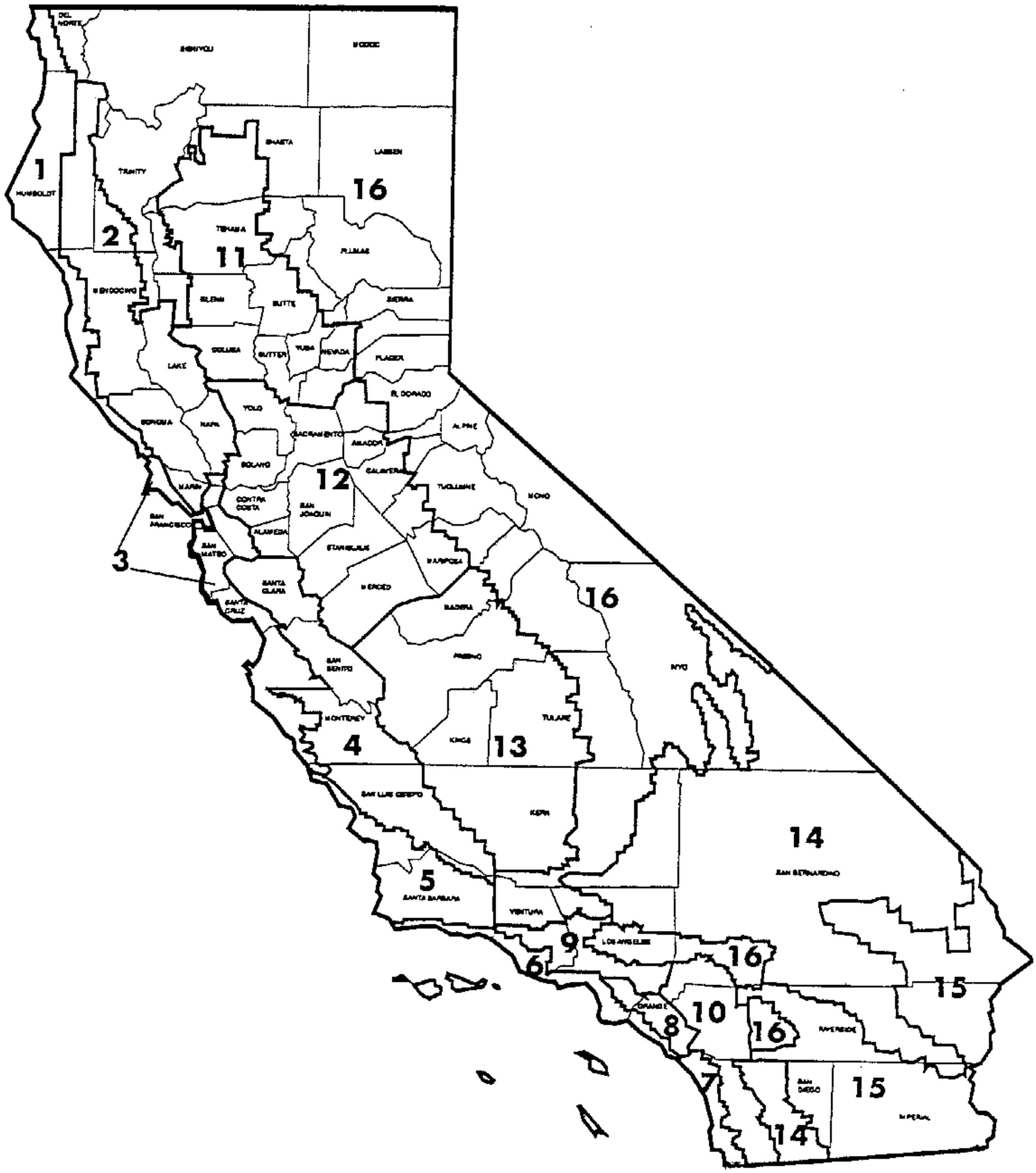
Since energy use depends partly upon weather conditions, which differ throughout the state, the *Energy Commission* has established 16 climate zones representing distinct climates within California (see Figure 1-2). These 16 climate zones are used with both the Residential and the Nonresidential *Standards*.

Detailed climate zone boundary descriptions and lists of locations within each zone are available in the *Energy Commission* publication\ California Climate Zone Descriptions for New Buildings, July 1995, (P400-95-041), and are included in this *Manual* as Appendix C.

Note: Cities may occasionally straddle two climate zones. In these instances, the exact building location and correct climate zone should be verified before any calculations are performed.

If a single building is split by a climate zone boundary line, it must be designed to the requirements of the climate zone in which 50 percent or more of the building is contained.

Figure 1-3–California Climate Zones



1.4.4 Nonresidential Compliance Approaches

A. Prescriptive Approach

Building Envelope The prescriptive envelope requirements are determined either by the Envelope Component Approach or the Overall Envelope Approach. These two approaches are described in detail in Chapter 3, beginning with an introduction in Section 3.1. The stringency of the envelope requirements varies according to climate zone and occupancy type.

Mechanical The prescriptive mechanical requirements are described in detail in Chapter 4. The prescriptive *Standards* do not offer any alternative approaches, but specify hardware features and design procedures that must be followed.

Lighting The prescriptive lighting requirements are determined by one of three methods: the Complete Building Method, the Area Category Method, or the Tailored Method. These three approaches are described in detail in Chapter 5, beginning with an introduction in Section 5.2.2. The allowed lighting under the *Standards* varies according to the requirements of the particular building occupancy or task requirements.

1.4.5 Performance Approach

The performance approach allows a wider variety of design strategies and provides greater flexibility than the prescriptive approach. It is based on an energy simulation model of the building. The *Standards* specify the method for determining an energy budget for the building. This is known as the *custom energy budget,* because it is generated on a case-by-case basis. This energy budget represents the upper limit of energy use allowed for that particular building.

Four basic steps are involved:

- Design the building with energy efficiency measures that are expected to be sufficient to meet the energy budget. (The prescriptive approach requirements provide a good starting point for the development of the design.)
- Demonstrate that the building complies with the mandatory measures (see Chapters 3, 4, 5 and 6).
- Using an approved calculation method, model the energy consumption of the building using the proposed features to create the proposed energy budget. The model will also automatically calculate the allowed energy budget for the proposed building

If the proposed energy budget is no greater than the allowed energy budget, the building complies.

The designer is permitted to trade off different aspects of the building design, one against the other, when permit applications for more than one component are submitted at the same time. As long as total energy use considering all installed components does not exceed the allowed budget, the tradeoff is acceptable.